Mapping Solar Potential and Monitoring the Performance of Solar Systems

April 15, 2008

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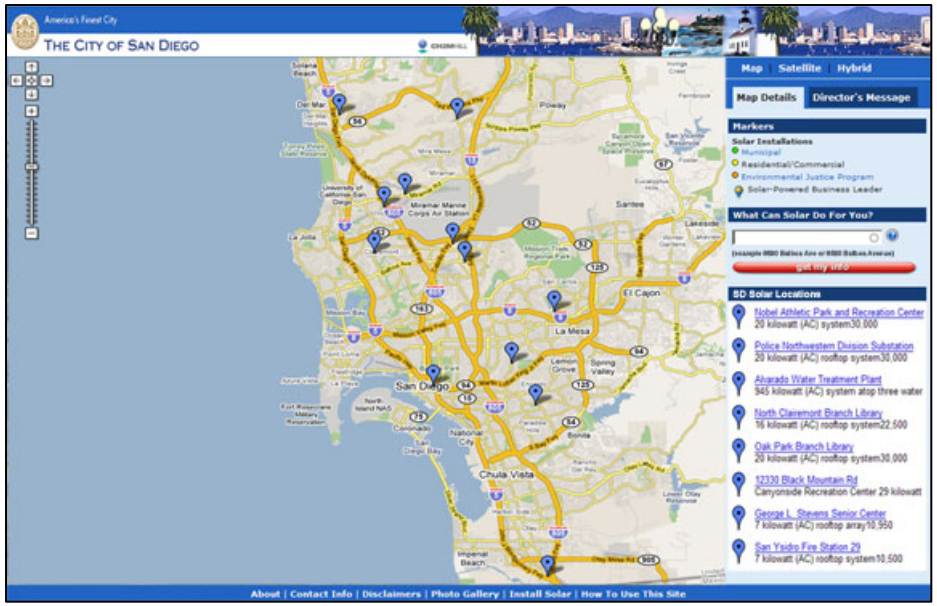
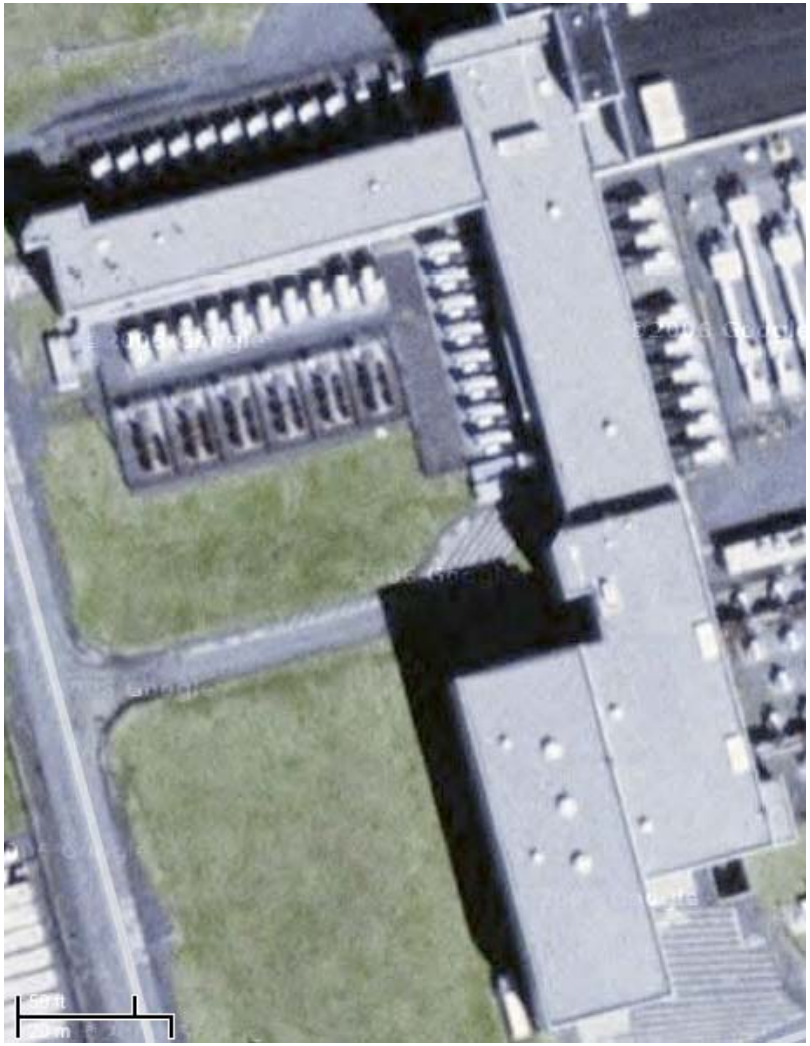
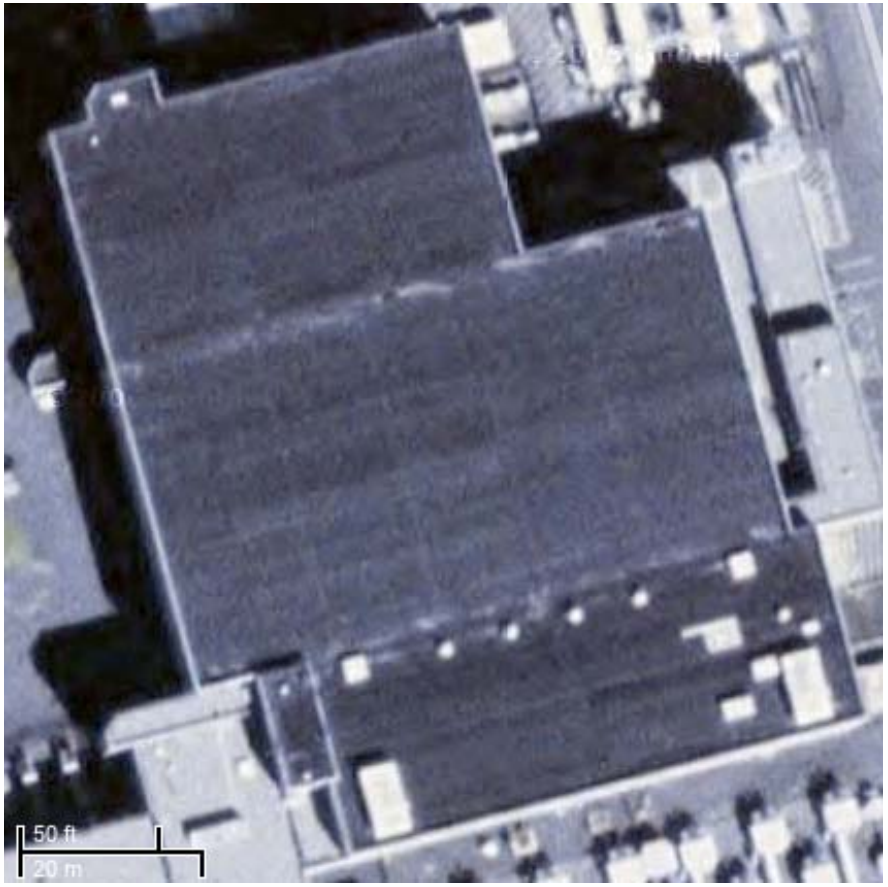
What is Solar Mapping?

- Solar mapping is the development of a web based portal that provides users with the ability to see an image of their roof-top and a calculation of the area's Solar PV panel potential

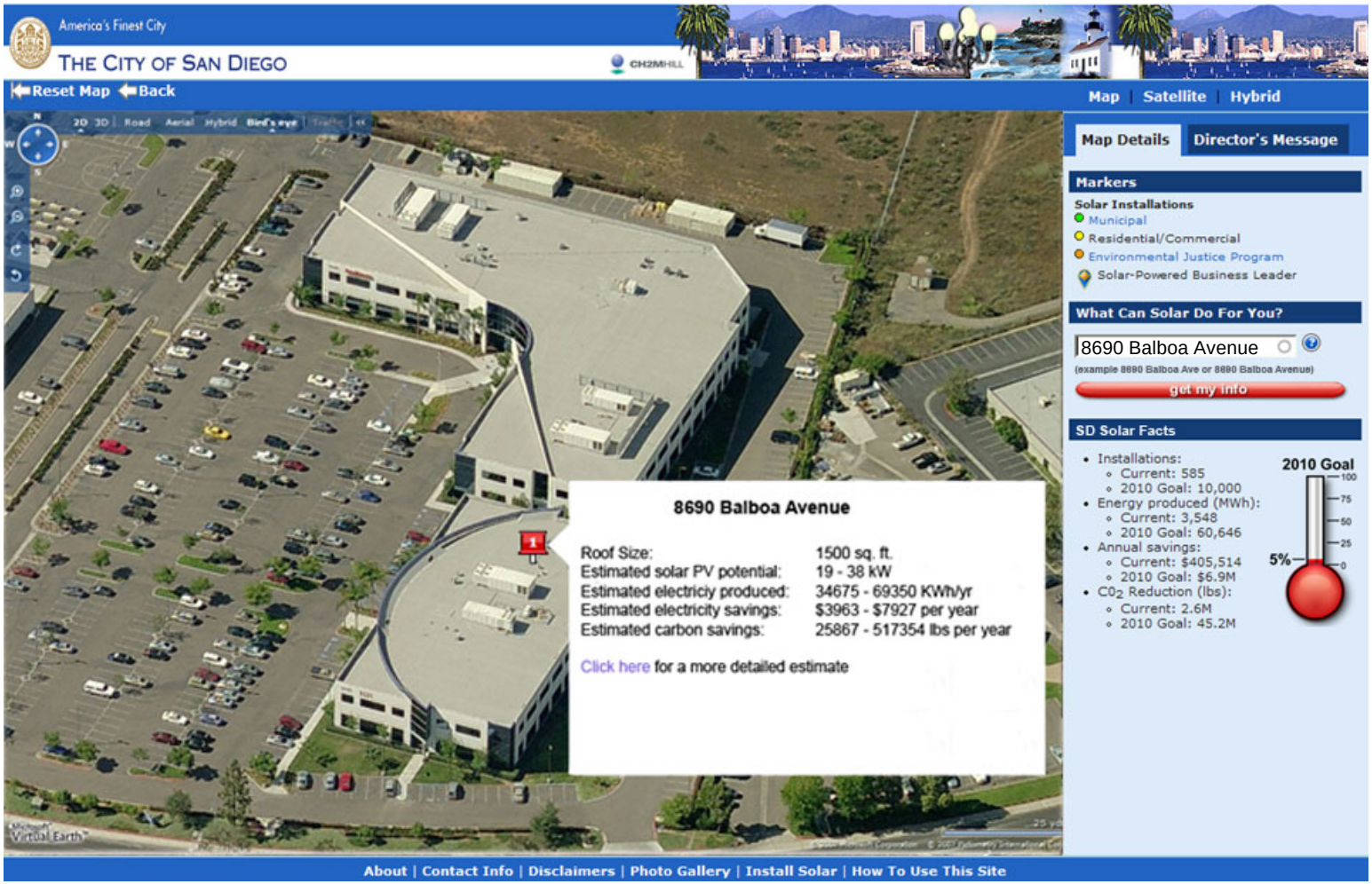


Google Map Images of the Princeton Plasma Physics Laboratory

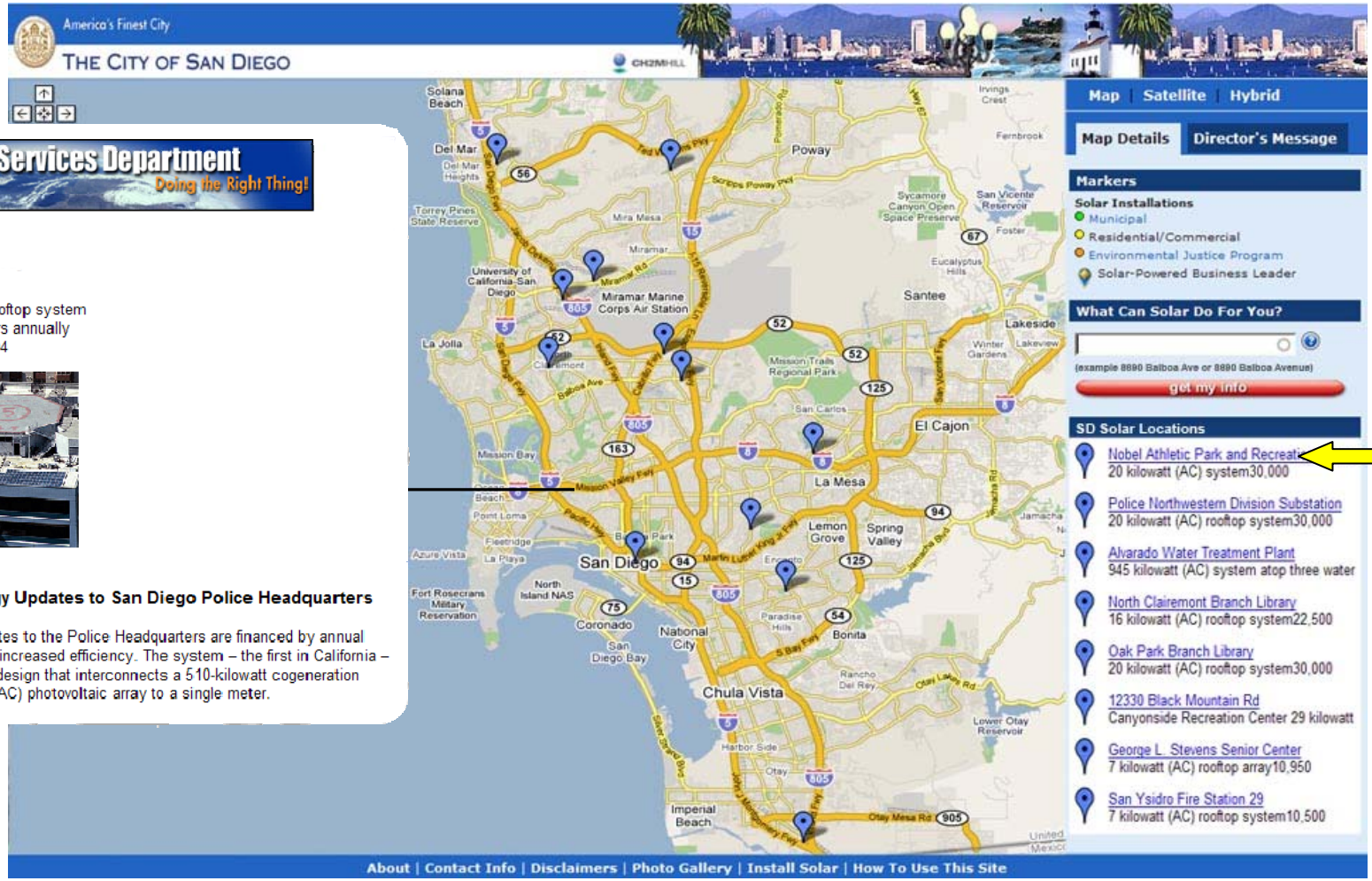




Analyzing the Potential for an Existing Building



San Diego Solar Locations



Outline of This Presentation

- Why monitor the performance of solar systems?
- What are the right parameters to measure?
- How do you measure these parameters?
- Who can monitor these systems for you?
- What are the obstacles to data monitoring?

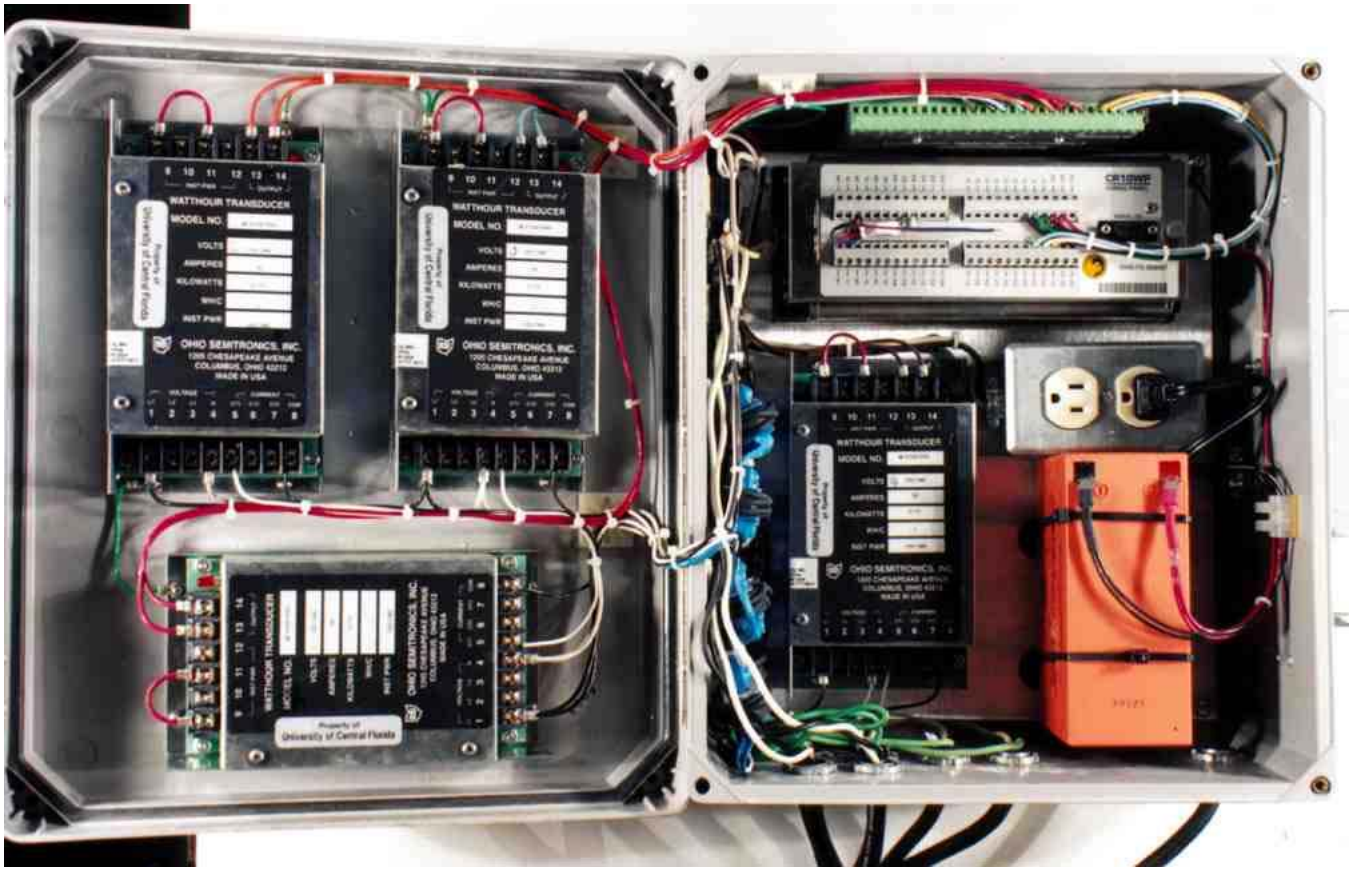
Why Monitor the Performance of Solar Systems?

- System Level
  - Determine if the system is working
  - Determine the energy production of the system
  - Determine when a failure occurs
- Outreach
  - Demonstrate to the public how the system works via a kiosk or over the internet
- Policy – Setting Goals
  - Benchmark the current renewable energy production
  - Determine the role of solar in meeting city goals for using renewable energy or meeting greenhouse gas emissions targets
  - Demonstrate to policymakers the impact of solar
- Example: Long Island Power Authority

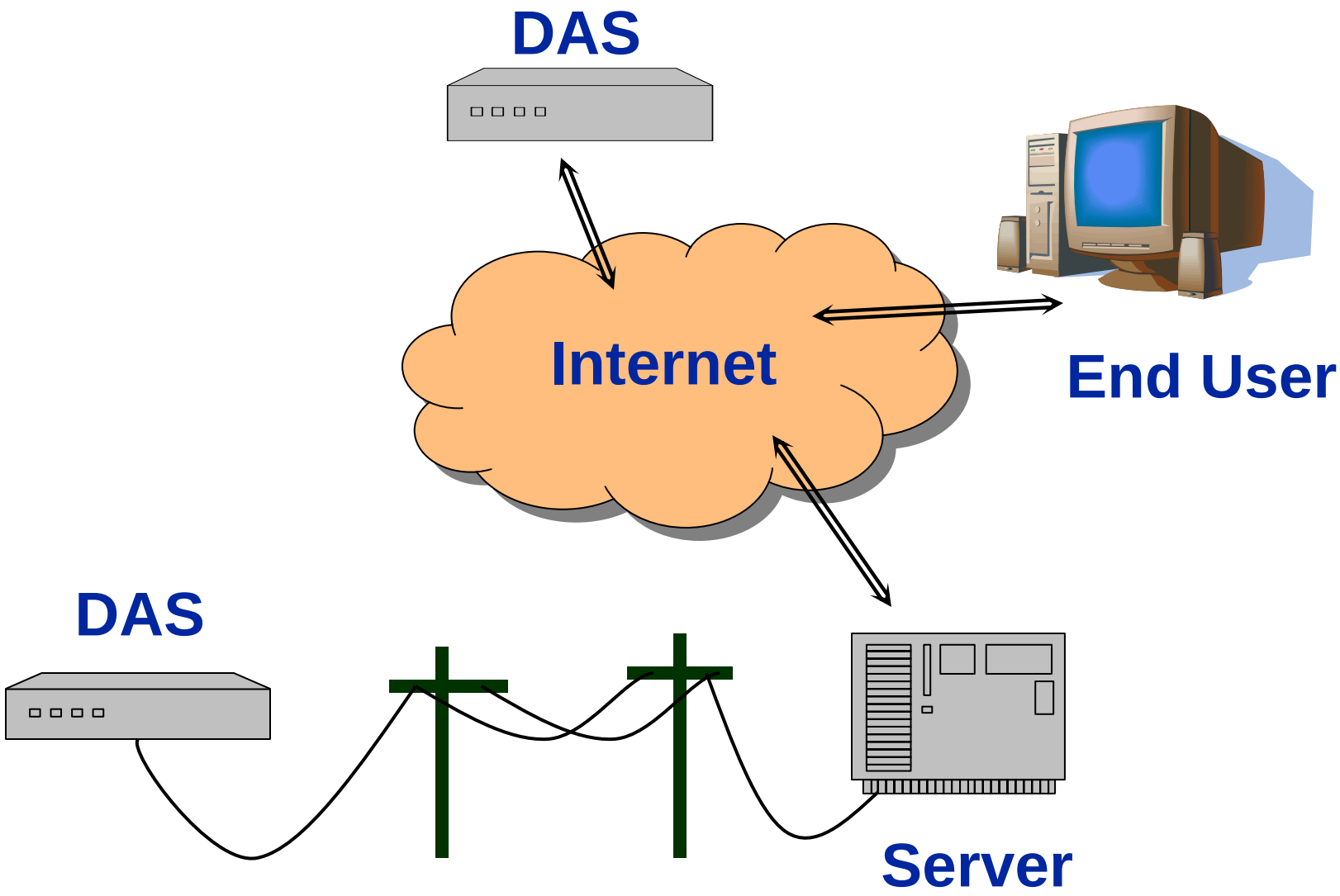
What are the right parameters to measure for PV?

- Photovoltaics
- Most Important Parameter (PV): AC Energy Output (kWh)
- Next Most Important: Solar Irradiation (kWh/m^2)
- Other Parameters to Measure
  - DC Voltage (V)
  - DC Current (A)
  - PV Array Temperature (˚F)
  - Wind Speed (MPH)
- Solar Hot Water
  - BTU Energy Output – Measure the temperature of the water and the flow rate out of the system or storage tank – the energy used by the hot water heater

Typical Datalogger



How do you measure these parameters?
DAS – Data Acquisition System

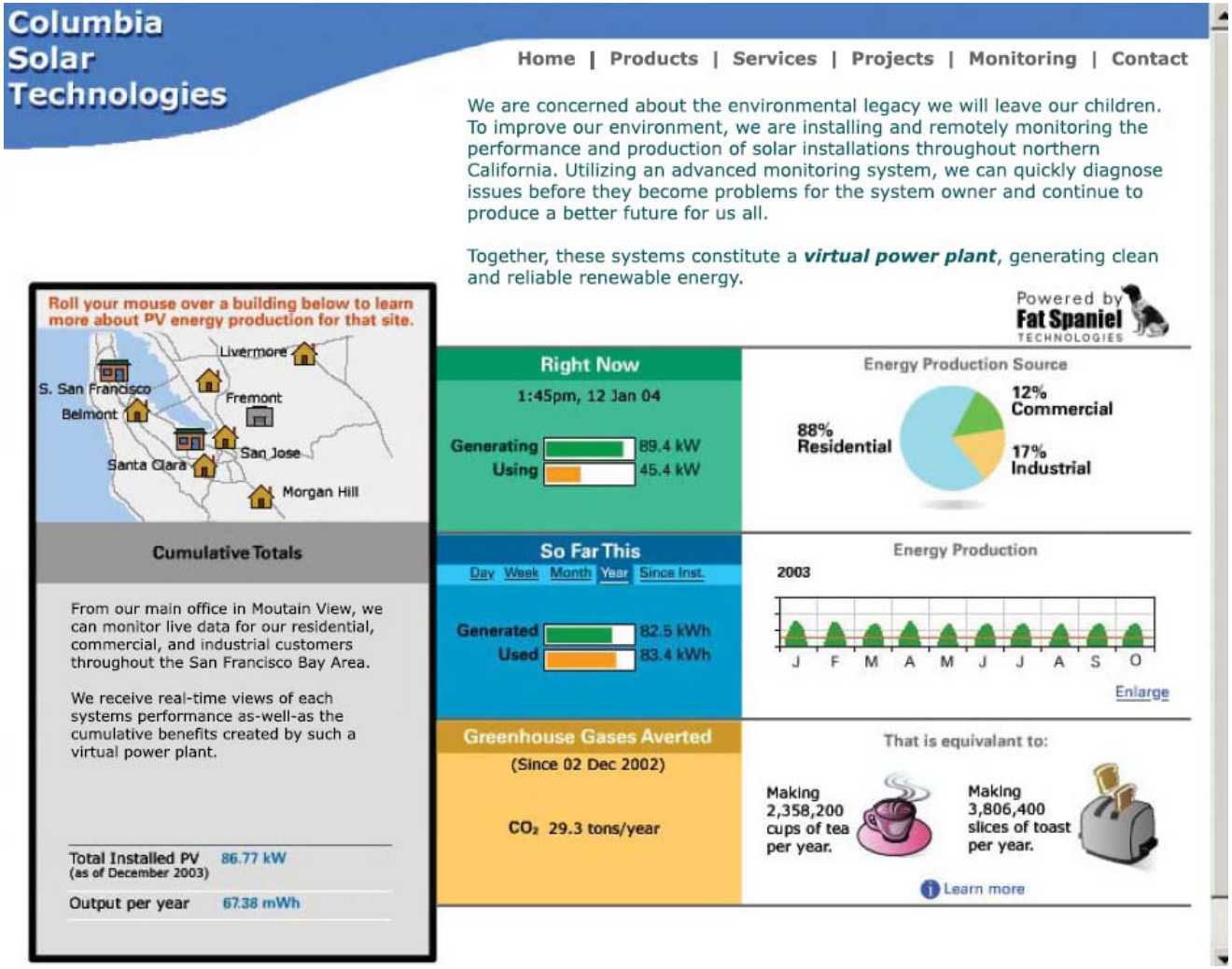


Datalogger at the Florida Solar Energy Center

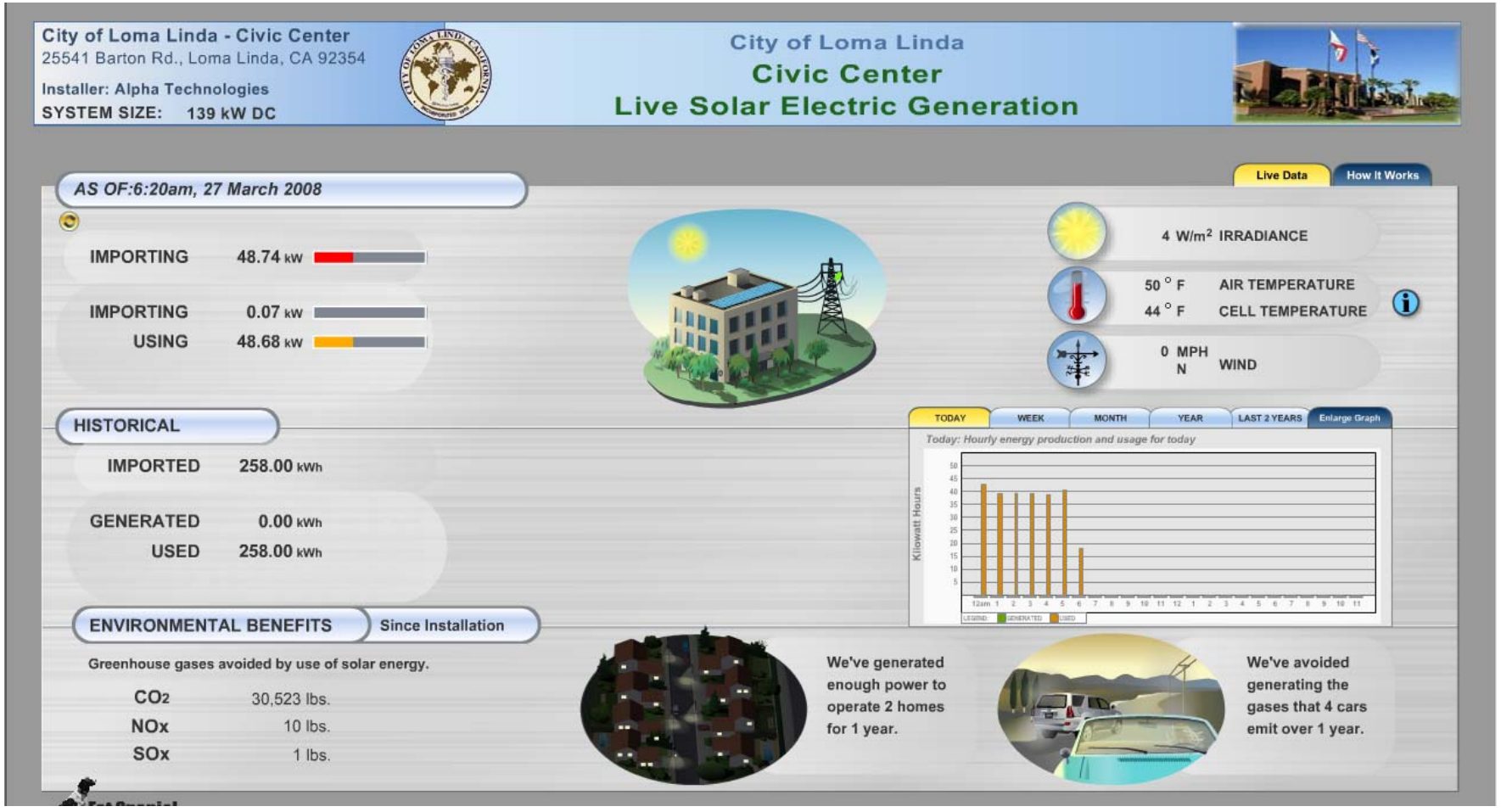
Who can monitor these systems for you?

- Data Monitoring Companies
  - Fat Spaniel
  - Heliotronics
  - Lucid Technologies
- Inverter Companies
  - Sunny Boy Web Box and Sunny Portal
  - Fronius SolarWeb
- PV Companies
  - SunPower will monitor large, commercial systems that they install

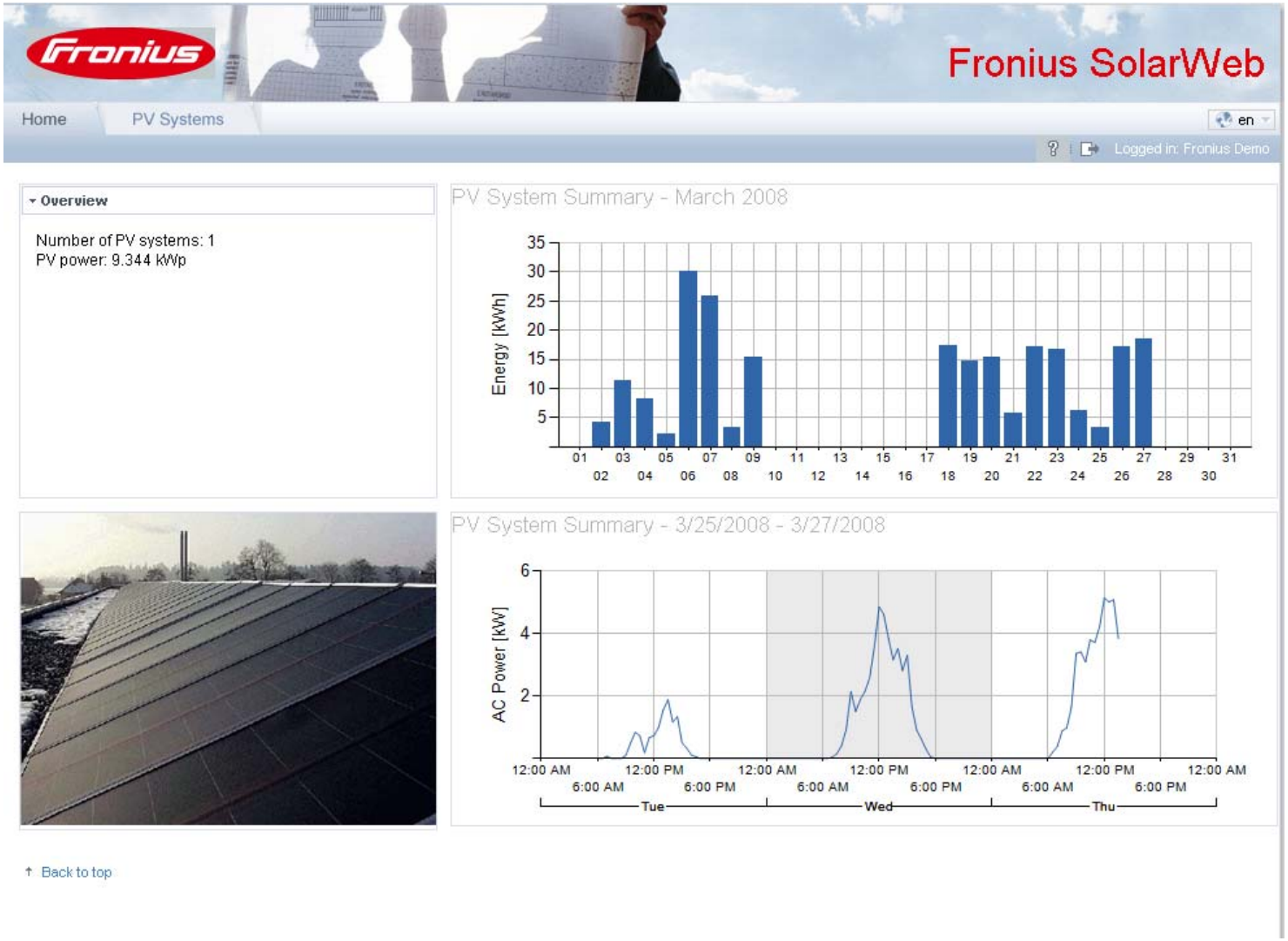
Fat Spaniel: City-Wide View



Graphic from Fat Spaniel



Fronius SolarWeb



What are the obstacles to monitoring solar system?

- **Cost**
  - *kWh meter* – few hundred dollars, may need to be collected manually
  - *Data Acquisition System (DAS)* – Usually over $1,000, can be several thousand dollars
  - *Monitoring over the internet* – usually an ongoing charge to for the vendor to continue collecting the data and presenting it on the internet
- **Maintenance**
  - *Calibration*: The data acquisition system needs to be calibrated on a regular basis to ensure the data is correct.
  - *Upkeep*: Who will maintain the DAS when problems arise?
- **Communication**
  - *Firewalls*: This can be a particular problem when monitor solar systems on school property